

**CATALOGUE OF ELECTIVE DISCIPLINES
UNDERGRADUATE LEVEL
«6B05202-Environment (Ecology)»**

| Cycle of disciplines | Name of disciplines and their main sections | Work-Tank (ECTS) |
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| GED 1 | THE CYCLE OF GENERAL EDUCATIONAL DISCIPLINES (GED) | 5 |
| 1. | Basis of the economy and business | 5 |
| | Social production. The essence, forms, structure of capital. Production cost. Income production in a market economy. The concept of business. Types of business activity. Theory of property, social forms of management. Goods, money. Socio-economic system. The emergence of the market. Financial system. The role of the state in business development. Macroeconomics. Resource saving. Cyclical economic development. Inflation and unemployment. Kazakhstan in the system of world economic relations | |
| 2. | Bases of the law and anti-corruption culture | 5 |
| | Basic provisions of the Constitution, current legislation of the RK; the system of state management bodies, the terms of reference, objectives, methods of state regulation of the economy, the role of the public sector in the economy; financial law and Finance, the mechanism of interaction of substantive and procedural law; the essence of corruption, the causes of its origin; the extent of moral and legal responsibility for corruption offences; the legislation in the field of combating corruption | |
| 3. | Health and safety of the person | 5 |
| | Life safety, its main provisions. Dangers, emergencies. Risk analysis, risk management. Security of the person. Destabilizing factors of our time. Social dangers, protection from them: dangers in the spiritual sphere, politics, protection from them: dangers in the economic sphere, dangers in everyday life. The system of life safety bodies, and legal regulation of their activities | |
| 4. | Ecology and sustainable development | 5 |
| | Basic laws of functioning of living organisms, ecosystems of different levels of organization, biosphere as a whole, their stability; interaction of components of biosphere and ecological consequences of economic activity of the person, especially in the conditions of intensification of nature management; modern representations about concepts, strategies and practical tasks of sustainable development in various countries and RK; problems of ecology, environmental protection, sustainable development | |
| BD 2 | CYCLE OF BASIC DISCIPLINES (BD) | |
| 1. | Environment and development nexus in Kazakhstan (in English) | 5 |
| | Brief physico-geographical characteristics of Kazakhstan; impact of pollution on the environment of Kazakhstan; environmental consequences of human activities; Zones of ecological catastrophe and environmental disaster; Environmental protection in the Republic of Kazakhstan; Kazakhstan's international and regional cooperation for the sustainable development of society | |
| | Bioresources Of Kazakhstan | 5 |
| | The main components of the ecosystem of Kazakhstan. Problems of biodiversity conservation. Principles of monitoring studies in the study of | |

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| | conservation of biological diversity. Effective use of specific plant communities. Programmes to combat desertification. Regularities of preservation of biological diversity of Kazakhstan. The problem of effective use of vegetation in Kazakhstan. Protection of rare and endangered species | |
| 2. | Physical geography of Kazakhstan | 5 |
| | Physical and geographical characteristics of Kazakhstan: geographical position of the country and natural components: relief, geological structure, climate, internal waters, soils, natural zones, flora and fauna; Characteristics of large physical and geographical territories of Kazakhstan: natural and territorial complexes; nature Protection and rational use of natural resources of Kazakhstan: problems of environmental ecology, effective use of subsoil of the Republic, protection of natural monuments | |
| | Landscape science | 5 |
| | The study of the emergence, changes in the state of the environment, the possibility of influencing it acting natural and anthropogenic forces. Give the concept of the unity of all natural components of the landscape sphere of the Earth. The study of the structure of evolutionary development and the dynamic changes in natural systems that are closely related to each other | |
| 3. | Ecology and economy of environmental management | 5 |
| | Fundamentals of nature management, teaching about the atmosphere, Geoecology, biogeography, environmental management systems, man-made systems and environmental risk, regional nature management. Nature management and environmental protection. Organization of environmental management. Methods of environmental management. Environmental management at the enterprise level. Organization and management of environmental management at the enterprise. Environmental standard of the enterprise. The main types of environmental entrepreneurship, the structure of the environmental market. Functions and forms of environmental entrepreneurship | |
| | Geography of Kazakhstan ecosystems | 5 |
| | Introduction to the course of geography of ecosystems of Kazakhstan, goals and objectives of the course, the historical formation of geoecological concepts, the state of the environment and nature of Kazakhstan, geographical and ecological processes in the environment. The impact of industrial and agricultural production in Kazakhstan on the environment. Problems of green economy development | |
| 4. | Theory of the biosphere | 5 |
| | The main components of the shell or of the sphere of Earth; the situation of the biosphere among the other areas of the Earth; the notion of "living material", its distribution and diversity, the main features and geological activity of living organisms in the biosphere; concept of ecosystem, the balance of energy and Cycling of matter in the biosphere; evolution of the biosphere; the concept of the noosphere by V. I. Vernadsky, the human impact on the biosphere | |
| | Biological ecology | 5 |
| | Diversity of living organisms. Climatic zoning. The concept of population and species. Statistical characteristics of the population. Regulation and population fluctuations. Gene flow. Gender drift. Basic concepts of synecology. Ecosystems, biogeocenosis. Trophic structure of the ecosystem. Energy balance of the ecosystem. Integrity and sustainability of ecosystems. | |

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| | Structure, evolution and stability conditions of the biosphere. Environmental principles for the protection of nature and biodiversity and the use of biological resources | |
| 5. | Human ecology | 5 |
| | Subject and methods of human ecology; development of scientific ideas and representations about human ecology; modern directions of researches in the field of human ecology at social and medico-biological levels; systems of concepts in human ecology; natural and anthropogenic factors and their influence on human health, human adaptation to environmental conditions; social aspects of human ecology | |
| | City ecology | 5 |
| | The role of urban ecology in environmental science. History of urban ecology. Ecological features of cities. Environmental factors and human ecology. Influence of geographical environment on human health. Solar activity, magnetic storms. Factors that cause stress. The human ontogenesis. The effect of radiation on human health. The influence of geophysical factors of environment on human health. Demography and human ecology. World food and nutrition problem. Demography and human ecology. Diseases arising from air pollution | |
| 6. | Ecology of water systems | 5 |
| | The subject, goals and tasks of aquatic ecology (the ecology of aquatic ecosystems). Basic concepts and definitions. Commonality and differences of water ecology and Hydrobiology (goals, theoretical and practical tasks, research methods). Basic laws and principles of water ecology. The main types of aquatic ecosystems. Organization of aquatic ecosystems. The main abiotic factors of aquatic ecosystems. Water properties that affect the life of hydrobionts. Water cycle. Biotic components | |
| | Ecology of nuclear test sites | 5 |
| | The history of the Semipalatinsk nuclear test site, the impact of nuclear tests on human health and the ecological state of natural ecosystems. The path of radiation contamination. Target theory. The danger of exposure to radiation contamination. Levels of ion radiation. Way of protection. Radiation damage to humans. Surface ecosystems. Freshwater ecosystems. Radio-ecological problems in Kazakhstan | |
| 7. | Physical and chemical methods of a research | 4 |
| | The course of the analytical process. Solutions. Qualitative analysis of parts and systems. Classification of reactions used to identify ions. Gravimetry and titration of the precipitate. Base titration of acidity. Oxidative restoration of the titration (Redoxometry). Complexometric titration. Methods of electrochemical analysis. Methods of optical analysis. Chromatographic methods of analysis. Mathematical processing of the analysis results | |
| | Environmental problems of petrochemistry | 4 |
| | The largest places of oil production and processing in the world. The flow of oil and oil products into the environment and its consequences. Problems of oil pollution of the world ocean. Oil and gas industry in Kazakhstan. Oil pollution of the Caspian sea. Measures to protect water resources from oil pollution. Prevention of soil pollution and its oil products | |
| 8. | Ecology of Plants and animals | 4 |

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| | <p>General laws of the relationship between organisms and the environment. Ecological groups of plants in relation to environmental conditions. Morphological and physiological mechanisms of plant thermoregulation. Abiotic and biotic factors on plants. General patterns of interaction between organisms and the environment. Physiological and morphological adaptation of animals to environmental conditions. Limiting factors, their ecological significance. Spatial structure of populations and its adaptive significance. Theoretical bases of animal population forecasting</p> | |
| | <p>Plant and animal resources of the Republic of Kazakhstan</p> | 4 |
| | <p>The study of plants; accounting; afforestation from seed of trees and shrubs and plants, renewal of the forest; tending of forest; timber extraction, deforestation and its regulation; growing seedlings in nurseries; irrigation; protection of forests from fires, pests and diseases; collecting mushrooms, tree SAP; measures for the rational use of plant resources necessary for the national economy in wood and forest products.</p> <p>General characteristics of the animal world. The voice of the animals. Swimming animals. Protective tendency of animals. The output of animals with disabilities. Flying animals. Animal migration. Sleep animals. Anatomy of animals. Biochemistry of animals. Histology of animals. The history of the classification of the animal world. Animal genetics. Morphology of animals. Sorting animals. Animal physiology. Animal ecology.</p> | |
| 9. | <p>Ecological biotechnology</p> | 5 |
| | <p>The concept of biotechnology, a brief history of its development; the main directions of modern biotechnology as an interdisciplinary field of scientific and technological progress; technologies of biotechnological production; the use of biotechnology in solving problems of environmental protection: wastewater treatment, atmosphere, soil; biotechnological alternatives in energy and agriculture</p> | |
| | <p>Agricultural biotechnology</p> | 5 |
| | <p>The history of the development of biotechnology. Classification of natural waters and types of pollution. Eutrophication of water bodies. Freshwater and marine ecosystems. Self-cleaning of reservoirs. Composition and properties of industrial wastewater. Biotechnological treatment of industrial wastewater. Biotechnology of solid waste processing. Bacterial leaching of mineral raw materials</p> | |
| 10. | <p>Metrology, standardization and certification</p> | 5 |
| | <p>Goals and objectives of Metrology, standardization and certification. Objects and subjects means and methods of science; history of standardization, certification and Metrology. Fundamentals of measurement theory; verification and calibration of measurement systems; rules and procedures for certification; mandatory and voluntary certification; various methods of observation: experiment; analysis; synthesis; modeling; systematization; classification; etc.</p> | |
| | <p>Management and organization in ecology</p> | 5 |
| | <p>Organization and management in ecology. Ecological bases of the organization and management of natural resources. Environmental regulation environmental management. Ecological and economic problems with the use of new production materials. The state authorities of environmental management</p> | |

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| 11. | Bases of environmental assessment and audit | 5 |
| | Preparation of bachelors to participate in environmental examinations and audit of projects, environmental audits of industrial enterprises; to form ideas about the legal and technical regulation in the field of technosphere safety; to teach to plan and implement administrative procedures for the execution of the state function of supervision, to conduct surveys and inspections of the safe condition of objects, to prepare and execute basic documents | |
| | Applied ecology | 5 |
| | Prerequisites for the industrialization of society; experience and approaches to the economical use of natural resources of the environment; the possibility of functioning of resource-saving technologies and equipment; mastering the efficiency and benefits of environmentally sound technologies in industrial institutions; the study of the main sources of man-made pollution of the biosphere. Composition of waste water from industrial enterprises | |
| 12. | Geographic information systems in ecology and environmental management | 6 |
| | Definition and content of GIS and Geoinformatics concepts. Relevance of GIS application in processing and provision of environmental information. Historical data on the use of mathematical methods of analysis and modeling in Geoecology. Characteristics of the main functions of GIS. Classification of GIS by territorial scope, by objectives, by subject. Registration. Data entry and storage in GIS | |
| | Natural resources and rational nature management of Kazakhstan | 6 |
| | The relationship between society and nature; the impact of economic, social and economic processes on the environment and rational ways of effective use of the environment and best practices. The analysis of the scientific and economic foundations of environmental Economics; General characteristics of the natural resource potential of the Republic of Kazakhstan and environmental issues; modern economic mechanism of nature use; problems and prospects of management system in the field of nature management and environmental protection in the Republic of Kazakhstan. Theoretical problems of nature management | |
| PD 3 | CYCLE OF PROFILE DISCIPLINES (PD) | |
| 1. | Environmental impact assessment (EIA) | 4 |
| | The concept of environmental impact assessment. Legal basis for environmental impact assessment. The user assessment of environmental impacts and the stages of the procedure. The main methods of environmental impact assessment and environmental impact of small enterprises. Identification and assessment of environmental risks; Compliance with environmental safety | |
| | Soil ecology | 4 |
| | The concept of soil structure, the value of the soil. Consequences of soil degradation. Desertification is a global ecological problem of soils. The water balance of the soil. Biological factors of soil formation. The role of microorganisms in soil formation. The role of relief in soil formation. Influence of weather on soil formation. Geographical patterns of soil distribution. Distribution of soil by zones | |
| 2. | Ecological rationing of anthropogenic influences | 5 |
| | Fundamentals of environmental regulation environmental impact | |

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| | management. Environmental regulation. The main characteristics of environmental regulation of economic activity. The main characteristics of environmental regulation under the influence on various natural environments. Environmental regulation to preserve the sustainability of ecosystems. Normalization of the quality of air components. Regulation of water and soil conditions | |
| | Environmental protection and conservation | 5 |
| | The concept of environmental protection. Conservation business in Kazakhstan. Modern ecological condition of nature reserves of Kazakhstan. Natural national parks in Kazakhstan, their ecology and natural conditions. Flora and fauna intended for special protection in Kazakhstan. Nature reserves, nature reserves, water protection zones, natural monuments and their current state | |
| 3. | Ecological forecast | 5 |
| | Introduction. The need to assess and predict the impact of human activities on Biosystems at different levels. Goals and objectives of forecasting. Theoretical foundations of forecasting. Methodological bases of forecasting. The theoretical basis of the model predictions. The concept of "forecast", "forecasting". Forecasting method. Expert evaluation. Extrapolation and interpolation. Normative forecast. Short - and long-term forecasts | |
| | Air basin ecology | 5 |
| | Sources of air pollution, their environmental consequences. Global and regional environmental problems of the atmosphere. Resources of atmosphere and sun rays. The quality of the natural environment. Properties of water, earth, air atmosphere. Radioactive contamination, noise, vibration and electromagnetic effects | |
| 4. | Statistics of the environment and modeling | 4 |
| | Statistics and model of geosystem as a scientific basis of nature management. Methodological and theoretical foundations of modeling and statistics. Kind model. Methods of collection and processing of statistical information. Modeling as a method of environmental research. The GIS approach to modeling spatial structure. Mathematical modeling of the environment. Statistics and modeling of local and global natural processes. The main stages of development and research of models on the computer | |
| | Environmental law of the Republic of Kazakhstan | 4 |
| | The concept of environmental law. Environmental legal history, development and prospects. The right of ownership of natural objects. Environmental law. Organizational and legal forms of state management of natural resources and environmental protection. Measures to ensure environmental safety in Kazakhstan. Responsibility for violation of the legislation on environmental protection. Legal protection of land. Legal regime of subsoil and its protection. Legal regime of water and its protection. Legal protection of atmospheric air. Legal regime of forests and their protection. Legal regime of use and protection of wildlife | |